What is claimed is:

1. A method of evaluating whiteness of light emitted from
a light source, comprising the steps of:

calculating chroma C, using a method defined by the
CIE 1997 Interim Color Appearance Model (Simple Version);
and

calculating whiteness W from the chroma C using an
equation (1),

$$W = aC + b \cdot \cdot \cdot (1)$$

where the coefficient a is a negative real number
and the coefficient b is a positive real number.

2. The method of Claim 1,
wherein the whiteness W is 100 when the chroma C is 0.

3. The method of Claim 2,
wherein the whiteness W is 50 under a standard
illuminant A.

4. The method of Claim 1,
wherein the chroma C is a chroma of the light emitted
from the light source, and
the coefficient a is -5.3 and the coefficient b is 100.

5. The method of Claim 1,

2   wherein the chroma C is a chroma of light obtained

3 when the light from the light source is reflected off from

4 a surface of an object whose Munsell value and Munsell chroma

5 is 9.5 and 0, respectively, and

6   the coefficient a is -4.4 and the coefficient b is 100.

1   6. The method of Claim 1,

2   wherein the chroma is a chroma of light obtained when

3 the light emitted from the light source is reflected off

4 a blank surface of a newspaper, and

5   the coefficient a is -3.3 and the coefficient b is 100.

1   7. A method of evaluating comparative whiteness

2 of light emitted from two light sources, comprising the

3 steps of:

4   calculating chroma C1 of light from a first

5 light source and chroma C2 of light from a second light

6 source using a method defined by the CIE 1997 Interim

7 Color Appearance Model(Simple Version); and

8   calculating comparative whiteness Wc from the chroma C1

9 and the chroma C2, using an equation (2),

10    $Wc = (C1 - C2) \;/\; C1 \;\cdot\cdot\cdot\; (2).$

1   8. A light source, being characterized by:

2   emitting light whose whiteness is no smaller

3   than 85 and whose visual clarity index is no smaller than 110,

4   the whiteness W being calculated using chroma C of the light

5   and an equation (3),

6 $$W = -5.3C + 100 \quad \cdot \cdot \cdot (3)$$

7   wherein the chroma C is calculated using a method

8   defined by the CIE 1997 Interim Color Appearance Model(Simple

9   Version)

1   9. The light source of Claim 8,

2   wherein the light source is a fluorescent lamp

3   containing a phosphor layer, the light source emitting light

4   whose peak emissions are in four wavelength ranges of 440nm to

5   470nm, 505nm to 530nm, 540nm to 570nm, and 600nm to 620nm; and

6   wherein a ratio of a radiant energy Qv to a radiant

7   energy Qg satisfies an inequality (4) for a correlated color

8   temperature T[K]

9 $$Qg/Qv \geqq -0.11 \times 10^{4}/T + 0.30 \quad \cdot \cdot \cdot (4)$$

10   wherein the radiant energy Qv is in a wavelength of

11   380nm to 780nm and radiant energy Qg in a wavelength

12   of 505nm to 530nm.

1   10. The light source of Claim 9,

2   wherein the phosphor layer contains, as major components:

3   a phosphor containing bivalent Europium as an

4 emission center and having a peak emission at a wavelength range

5 of 440nm to 470nm;

6   a phosphor containing bivalent manganese as an emission

7 center and having a peak emission at a wavelength range of 505nm

8 to 530nm;

9   a phosphor containing trivalent terbium as an emission

10 center and having a peak emission at a wavelength range of 540nm

11 to 570nm; and

12   a phosphor containing trivalent europium as an emission

13 center and having a peak emission at a wavelength range of 600nm

14 to 620nm.

1   11. The light source of Claim 10,

2   wherein the phosphor containing the bivalent europium as

3 an emission center and having a peak emission at a wavelength

4 range of 440nm to 470nm is composed of at least one of:

5      $BaMgAl_{10}O_{17}:Eu^{2+}$;

6      $BaMgAl_{10}O_{17}:Eu^{2+}, Mn^{2+}$; and

7      $(Ba, Ca, Sr, Mg)_{10}(PO_4)_6Cl_2:Eu^{2+}$

8   wherein compounds on the left side denote host crystals,

9 and ions on the right side are emission centers contained in

10 the phosphors.

1   12. The light source of Claim 10,

2   wherein the phosphor containing the bivalent manganese

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3   as an emission center and having a peak emission at a wavelength

4   range of 505nm to 530nm is composed of at least one of:

5        $BaMgAl_{10}O_{17}:Eu^{2+},Mn^{2+};$

6        $CeMgAl_{11}O_{19}:Mn^{2+};$

7        $Ce\ (Mg,\ Zn)\ Al_{11}O_{19}:Mn^{2+};$

8        $Zn_2SiO_4:Mn^{2+};$ and

9        $CeMgAl_{11}O_{19}:Tb^{3+},Mn^{2+}$

10   wherein compounds on the left side denote host crystals,

11   and ions on the right side are emission centers contained in

12   the phosphors.

1   13. The light source of Claim 10,

2   wherein the phosphor containing the trivalent terbium

3   as an.emission center and having an emission peak at a wavelength

4   range of 540nm to 570nm is composed of at least one of:

5        $LaPO_4:Ce^{3+},Tb^{3+};$ and

6        $CeMgAl_{11}O_{19}:Tb^{3+}$

7   wherein compounds on the left side denote host crystals,

8   and ions on the right side are emission centers contained in

9   the phosphors.

1   14. The light source of Claim 10,

2   wherein the phosphor containing the trivalent europium

3   as an emission center and having an emission peak at a wavelength

4   range of 600nm to 620nm is composed of at least one of:

5        $Y_2O_3:Eu^{3+}$; and

6        $Gd_2O_3:Eu^{3+}$

7   wherein compounds on the left side denote host crystals,

8   and ions on the right side are emission centers contained in

9   the phosphors.

1   15. The light source of Claim 9,

2   wherein the phosphor layer has, as major components:

3   a phosphor containing both bivalent europium and bivalent

4   manganese as emission centers and having emission peaks both

5   at a wavelength range of 440nm to 470nm and at 505nm to 530nm;

6   a phosphor containing trivalent terbium as an emission

7   center and having an emission peak at a wavelength range of 540nm

8   to 570nm; and

9   a phosphor containing trivalent europium as an emission

10   center and having an emission peak at a wavelength range of 600nm

11   to 620nm.

1   16. The light source of Claim 15,

2   wherein the phosphor containing the bivalent europium and

3   bivalent manganese as emission centers and having emission peaks

4   both at a wavelength range of 440nm to 470nm and at 505nm to

5   530nm is

6        $BaMgAl_{10}O_{17}:Eu^{2+},Mn^{2+}$

7   wherein a compound on the left side denotes a host crystal,

8   and ions on the right side are emission centers contained in

9   the phosphor.

1   17. The light source of Claim 15,

2   wherein the phosphor containing the trivalent terbium

3   as an emission center and having an emission peak at a wavelength

4   range of 540nm to 570nm is composed of at least one of:

5        $LaPO_4:Ce^{3+}, Tb^{3+}$; and

6        $CeMgAl_{11}O_{19}:Tb^{3+}$

7   wherein compounds on the left side denote host crystals,

8   and ions on the right side are emission centers contained in

9   the phosphors.

1   18. The light source of Claim 15,

2   wherein the phosphor containing the trivalent europium

3   as an emission center and having an emission peak at a wavelength

4   range of 600nm to 620nm is composed of at least one of:

5        $Y_2O_3:Eu^{3+}$; and

6        $Gd_2O_3:Eu^{3+}$

7   wherein compounds on the left side denote host crystals,

8   and ions on the right side are emission centers contained in

9   the phosphors.

1   19. The light source of Claim 9,

2   wherein the phosphor layer contains, as major

3   components:

4   a phosphor containing bivalent europium as an emission

5   center and having an emission peak at 440nm to 470nm;

6   a phosphor containing both trivalent terbium and bivalent

7   manganese as emission centers and having emission peaks both

8   at a wavelength range of 505nm to 530nm and at 540nm to 570nm;

9   and

10   a phosphor containing trivalent europium as an emission

11 center and having an emission peak at 600nm.

1   20. The light source of Claim 19,

2   wherein the phosphor containing the bivalent europium as

3   an emission center and having a peak emission at a wavelength

4   range of 440nm to 470nm is composed of at least one of:

5       $BaMgAl_{10}O_{17}:Eu^{2+}$;

6       $BaMgAl_{10}O_{17}:Eu^{2+}, Mn^{2+}$; and

7       $(Ba, Ca, Sr, Mg)_{10}(PO_4)_6Cl_2:Eu^{2+}$

8   wherein compounds on the left side denote host crystals,

9   and ions on the right side are emission centers contained in

10 the phosphors.

1   21. The light source of Claim 19,

2   wherein the phosphor containing the trivalent terbium

3   and the bivalent manganese as emission centers and having peak

4   emissions both at a wavelength range of 505nm to 530nm and at

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5 540nm to 570nm is

6       $CeMgAl_{11}O_{19}:Tb^{3+},Mn^{2+}$

7   wherein a compound on the left side denotes a host crystal,

8 and ions on the right side are emission centers contained in

9 the phosphor.

1   22. The light source of Claim 19,

2   wherein the phosphor containing the trivalent europium

3 as an emission center and having an emission peak at a wavelength

4 range of 600nm to 620nm is composed of at least one of:

5       $Y_2O_3:Eu^{3+}$; and

6       $Gd_2O_3:Eu^{3+}$

7   wherein compounds on the left side denote host crystals,

8 and ions on the right side are emission centers contained in

9 the phosphors.

1   23. A light source, being characterized by:

2   emitting light whose whiteness W is no smaller than 85,

3 and whose visual clarity index is no smaller than 115, the

4 whiteness W being calculated using chroma C of the light and

5 an equation(5)

6       $$W = -5.3C + 100 \cdot \cdot \cdot (5)$$

7   wherein the chroma C is calculated using a method defined

8 by the CIE 1997 Interim Color Appearance Model (Simple Version).

1   24. The light source of Claim 23,

2   wherein the light source is a fluorescent lamp

3   containing a phosphor layer, the light source emitting light

4   whose peak emissions are in four wavelength ranges of 440nm to

5   470nm, 505nm to 530nm, 540nm to 570nm, and 600nm to 620nm; and

6   wherein a ratio of a radiant energy Qv to a radiant

7   energy Qg satisfies an inequality (6) for a correlated color

8   temperature T[K]

9           $Qg/Qv \geqq -0.11 \times 10^4/T + 0.30$ $\cdot \cdot \cdot$ (6)

10   wherein the radiant energy Qv is in a wavelength of

11 380nm to 780nm and radiant energy Qg in a wavelength

12   of 505nm to 530nm.

1   25. The light source of Claim 24,

2   wherein the phosphor layer contains, as major components:

3   a phosphor containing bivalent Europium as an

4   emission center and having a peak emission at a wavelength range

5   of 440nm to 470nm;

6   a phosphor containing bivalent manganese as an emission

7   center and having a peak emission at a wavelength range of 505nm

8   to 530nm;

9   a phosphor containing trivalent terbium as an emission

10 center and having a peak emission at a wavelength range of 540nm

11 to 570nm; and

12   a phosphor containing trivalent europium as an emission

1 center and having a peak emission at a wavelength range of 600nm

2 to 620nm.

1 26. The light source of Claim 25,

2 wherein the phosphor containing the bivalent europium as

3 an emission center and having a peak emission at a wavelength

4 range of 440nm to 470nm is composed of at least one of:

5 $BaMgAl_{10}O_{17}:Eu^{2+}$;

6 $BaMgAl_{10}O_{17}:Eu^{2+}, Mn^{2+}$; and

7 $(Ba, Ca, Sr, Mg)_{10}(PO_4)_6Cl_2:Eu^{2+}$

8 wherein compounds on the left side denote host crystals,

9 and ions on the right side are emission centers contained

10 in the phosphors.

1 27. The light source of Claim 25,

2 wherein the phosphor containing the bivalent manganese

3 as an emission center and having a peak emission at a wavelength

4 range of 505nm to 530nm is composed of at least one of:

5 $BaMgAl_{10}O_{17}:Eu^{2+},Mn^{2+}$;

6 $CeMgAl_{11}O_{19}:Mn^{2+}$;

7 $Ce(Mg, Zn)Al_{11}O_{19}:Mn^{2+}$;

8 $Zn_2SiO_4:Mn^{2+}$; and

9 $CeMgAl_{11}O_{19}:Tb^{3+},Mn^{2+}$

10 wherein compounds on the left side denote host crystals,

11 and ions on the right side are emission centers contained

12   in the phosphors.

1   28. The light source of Claim 25,

2   wherein the phosphor containing the trivalent terbium

3   as an emission center and having an emission peak at a wavelength

4   range of 540nm to 570nm is composed of at least one of:

5       $LaPO_4:Ce^{3+},Tb^{3+}$; and

6       $CeMgAl_{11}O_{19}:Tb^{3+}$

7   wherein compounds on the left side denote host crystals,

8   and ions on the right side are emission centers contained in

9   the phosphors.

1   29. The light source of Claim 25,

2   wherein the phosphor containing the trivalent europium

3   as an emission center and having an emission peak at a wavelength

4   range of 600nm to 620nm is composed of at least one of:

5       $Y_2O_3:Eu^{3+}$; and

6       $Gd_2O_3:Eu^{3+}$

7   wherein compounds on the left side denote host crystals,

8   and ions on the right side are emission centers contained

9   in the phosphors.

1   30. The light source of Claim 24,

2   wherein the phosphor layer has, as major components:

3   a phosphor containing both bivalent europium and bivalent

4   manganese as emission centers and having emission peaks both

5   at a wavelength range of 440nm to 470nm and at 505nm to 530nm;

6   a phosphor containing trivalent terbium as an emission

7   center and having an emission peak at a wavelength range of 540nm

8   to 570nm; and

9   a phosphor containing trivalent europium as an emission

10   center and having an emission peak at a wavelength range of 600nm

11   to 620nm.

1   31.   The light source of Claim 30,

2   wherein the phosphor containing the bivalent europium and

3   bivalent manganese as emission centers and having emission peaks

4   both at a wavelength range of 440nm to 470nm and at 505nm to

5   530nm is

6          $BaMgAl_{10}O_{17}:Eu^{2+},Mn^{2+}$

7   wherein a compound on the left side denotes a host crystal,

8   and ions on the right side are emission centers contained in

9   the phosphor.

1   32.   The light source of Claim 30,

2   wherein the phosphor containing the trivalent terbium

3   as an emission center and having an emission peak at a wavelength

4   range of 540nm to 570nm is composed of at least one of:

5          $LaPO_4:Ce^{3+},Tb^{3+}$; and

6          $CeMgAl_{11}O_{19}:Tb^{3+}$

7   wherein compounds on the left side denote host crystals,

8   and ions on the right side are emission centers contained in

9   the phosphors.

1   33. The light source of Claim 30,

2   wherein the phosphor containing the trivalent europium

3   as an emission center and having an emission peak at a wavelength

4   range of 600nm to 620nm is composed of at least one of:

5        $Y_2O_3:Eu^{3+}$; and

6        $Gd_2O_3:Eu^{3+}$

7   wherein compounds on the left side denote host crystals,

8   and ions on the right side are emission centers contained

9   in the phosphors.

1   34. The light source of Claim 24,

2   wherein the phosphor containing the bivalent europium as

3   an emission center and having a peak emission at a wavelength

4   range of 440nm to 470nm is composed of at least one of:

5        $BaMgAl_{10}O_{17}:Eu^{2+}$;

6        $BaMgAl_{10}O_{17}:Eu^{2+}, Mn^{2+}$; and

7        $(Ba, Ca, Sr, Mg)_{10}(PO_4)_6Cl_2:Eu^{2+}$

8   wherein compounds on the left side denote host crystals,

9   and ions on the right side are emission centers contained in

10   the phosphors.

1   35. The light source of Claim 34,

2   wherein the phosphor containing the bivalent europium as

3   an emission center and having a peak emission at a wavelength

4   range of 440nm to 470nm is composed of at least one of:

5        $BaMgAl_{10}O_{17}:Eu^{2+}$;

6        $BaMgAl_{10}O_{17}:Eu^{2+}, Mn^{2+}$; and

7        $(Ba, Ca, Sr, Mg)_{10}(PO_4)_6Cl_2:Eu^{2+}$

8   wherein compounds on the left side denote host crystals,

9   and ions on the right side are emission centers contained in

10   the phosphors.

1   36. The light source of Claim 34,

2   wherein the phosphor containing the trivalent terbium

3   and the bivalent manganese as emission centers and having peak

4   emissions both at a wavelength range of 505nm to 530nm and at

5   540nm to 570nm is

6        $CeMgAl_{11}O_{19}:Tb^{3+}, Mn^{2+}$

7   wherein a compound on the left side denotes a host crystal,

8   and ions on the right side are emission centers contained

9   in the phosphor.

1   37. The light source of Claim 34,

2   wherein the phosphor containing the trivalent europium

3   as an emission center and having an emission peak at a wavelength

4   range of 600nm to 620nm is composed of at least one of:

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5 $Y_2O_3:Eu^{3+}$; and

6 $Gd_2O_3:Eu^{3+}$

7 wherein compounds on the left side denote host crystals,

8 and ions on the right side are emission centers contained

9 in the phosphors.

1 38. A light source, being characterized by:

2 emitting light whose whiteness is no smaller than 65

3 obtained when the light is reflected from a blank surface of

4 a newspaper, the whiteness being calculated using chroma C of

5 the light and an equation (7),

6 $$W = -3.3C + 100 \cdots (7)$$

7 wherein the chroma C is calculated using a method defined

8 by the CIE 1997 Interim Color Appearance Model (Simple Version);

9 emitting light whose chromaticity is, on the CIE 1931

10 chromaticity diagram, in a range expressed by two equations (8)

11 and (9); and

12 emitting light whose visual clarity index is no smaller

13 than 110:

14 $$y \geqq -2.63x^2 + 2.63x - 0.263 \cdots (8)$$

15 $$y \geqq -3.09x + 1.22 \cdots (9).$$

1 39. The light source of Claim 38,

2 wherein the light source is a fluorescent lamp

3 containing a phosphor layer, the light source emitting light

4 whose peak emissions are in four wavelength ranges of 440nm to

5 470nm, 505nm to 530nm, 540nm to 570nm, and 600nm to 620nm; and

6 wherein a ratio of a radiant energy Qv to a radiant

7 energy Qg satisfy an inequality (4) for a correlated color

8 temperature $T[K]$

9 $$Qg/Qv \geqq -0.11 \times 10^4/T + 0.30 \quad \cdots (4)$$

10 wherein the radiant energy Qv is in a wavelength of

11 380nm to 780nm and radiant energy Qg in a wavelength of 505nm

12 to 530nm.

1 40. The light source of Claim 39,

2 wherein the phosphor layer contains, as major components:

3 a phosphor containing bivalent europium as an

4 emission center and having a peak emission at a wavelength range

5 of 440nm to 470nm;

6 a phosphor containing bivalent manganese as an emission

7 center and having a peak emission at a wavelength range of 505nm

8 to 530nm;

9 a phosphor containing trivalent terbium as an emission

10 center and having a peak emission at a wavelength range of 540nm

11 to 570nm; and

12 a phosphor containing trivalent europium as an emission

13 center and having a peak emission at a wavelength range of 600nm

14 to 620nm.

1   41.   The light source of Claim 40,

2   wherein the phosphor containing the bivalent europium as

3 an emission center and having a peak emission at a wavelength

4 range of 440nm to 470nm is composed of at least one of:

5      $BaMgAl_{10}O_{17}:Eu^{2+}$;

6      $BaMgAl_{10}O_{17}:Eu^{2+}, Mn^{2+}$; and

7      $(Ba, Ca, Sr, Mg)_{10}(PO_4)_6Cl_2:Eu^{2+}$

8   wherein compounds on the left side denote host crystals,

9 and ions on the right side are emission centers contained

10 in the phosphors.

1   42.   The light source of Claim 40,

2   wherein the phosphor containing the bivalent manganese

3 as an emission center and having a peak emission at a wavelength

4 range of 505nm to 530nm is composed of at least one of:

5      $BaMgAl_{10}O_{17}:Eu^{2+},Mn^{2+}$;

6      $CeMgAl_{11}O_{19}:Mn^{2+}$;

7      $Ce(Mg, Zn)Al_{11}O_{19}:Mn^{2+}$;

8      $Zn_2SiO_4:Mn^{2+}$; and

9      $CeMgAl_{11}O_{19}:Tb^{3+},Mn^{2+}$

10   wherein compounds on the left side denote host crystals,

11 and ions on the right side are emission centers contained in

12 the phosphors.

1   43.   The light source of Claim 40,

2   wherein the phosphor containing the trivalent terbium

3   as an emission center and having an emission peak at a wavelength

4   range of 540nm to 570nm is composed of at least one of:

5       $LaPO_4:Ce^{3+}, Tb^{3+}$; and

6       $CeMgAl_{11}O_{19}:Tb^{3+}$

7   wherein compounds on the left side denote host crystals,

8   and ions on the right side are emission centers contained in

9   the phosphors.

1   44.   The light source of Claim 40,

2   wherein the phosphor containing the trivalent europium

3   as an emission center and having an emission peak at a wavelength

4   range of 600nm to 620nm is composed of at least one of:

5       $Y_2O_3:Eu^{3+}$; and

6       $Gd_2O_3:Eu^{3+}$

7   wherein compounds on the left side denote host crystals,

8   and ions on the right side are emission centers contained

9   in the phosphors.

1   45.   The light source of Claim 39,

2   wherein the phosphor layer has, as major components:

3   a phosphor containing both bivalent europium and bivalent

4   manganese as emission centers and having emission peaks both

5   at a wavelength range of 440nm to 470nm and at 505nm to 530nm;

6   a phosphor containing trivalent terbium as an emission

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7   center and having an emission peak at a wavelength range

8   to 570nm; and

9   a phosphor containing trivalent europium as an emis

10 center and having an emission peak at a wavelength range of 600

11 to 620nm.

1   46.   The light source of Claim 45,

2   wherein the phosphor containing the bivalent europium and

3   bivalent manganese as emission centers and having emission peaks

4   both at a wavelength range of 440nm to 470nm and at 505nm to

5   530nm is

6        $BaMgAl_{10}O_{17}:Eu^{2+}, Mn^{2+}$

7   wherein a compound on the left side denotes a host crystal,

8   and ions on the right side are emission centers contained in

9   the phosphor.

1   47.   The light source of Claim 45,

2   wherein the phosphor containing the trivalent terbium

3   as an emission center and having an emission peak at a wavelength

4   range of 540nm to 570nm is composed of at least one of:

5        $LaPO_4:Ce^{3+}, Tb^{3+}$; and

6        $CeMgAl_{11}O_{19}:Tb^{3+}$

7   wherein compounds on the left side denote host crystals,

8   and ions on the right side are emission centers contained in

9   the phosphors.

1   48.   The light source of Claim 45,

2   wherein the phosphor containing the trivalent europium

3 as an emission center and having an emission peak at a wavelength

4 range of 600nm to 620nm is composed of at least one of:

5         $Y_2O_3:Eu^{3+}$; and

6         $Gd_2O_3:Eu^{3+}$

7   wherein compounds on the left side denote host crystals,

8   and ions on the right side are emission centers contained

9   in the phosphors.

1   49.   The light source of Claim 39,

2   wherein the phosphor layer contains, as major

3 components:

4   a phosphor containing bivalent europium as an emission

5 center and having an emission peak at 440nm to 470nm;

6   a phosphor containing both trivalent terbium and bivalent

7 manganese as emission centers and having emission peaks both

8 at a wavelength range of 505nm to 530nm and at 540nm to 570nm;

9 and

10   a phosphor containing trivalent europium as an emission

11 center and having an emission peak at 600nm.

1   50. The light source of Claim 49,

2   wherein the phosphor containing the bivalent europium as

3 an emission center and having a peak emission at a wavelength

4   range of 440nm to 470nm is composed of at least one of:

5         $BaMgAl_{10}O_{17}:Eu^{2+}$;

6         $BaMgAl_{10}O_{17}:Eu^{2+}, Mn^{2+}$; and

7         $(Ba, Ca, Sr, Mg)_{10}(PO_4)_6Cl_2:Eu^{2+}$

8   wherein compounds on the left side denote host crystals,

9   and ions on the right side are emission centers contained in

10   the phosphors.

1   51.   The light source of Claim 49,

2   wherein the phosphor containing the trivalent terbium

3   and the bivalent manganese as emission centers and having peak

4   emissions both at a wavelength range of 505nm to 530nm and at

5   540nm to 570nm is

6         $CeMgAl_{11}O_{19}:Tb^{3+},Mn^{2+}$

7   wherein a compound on the left side denotes a host crystal,

8   and ions on the right side are emission centers contained in

9   the phosphor.

1   52.   The light source of Claim 49,

2   wherein the phosphor containing the trivalent europium

3   as an emission center and having an emission peak at a wavelength

4   range of 600nm to 620nm is composed of at least one of:

5         $Y_2O_3:Eu^{3+}$; and

6         $Gd_2O_3:Eu^{3+}$

7   wherein compounds on the left side denote host crystals,

8   and ions on the right side are emission centers contained

9   in the phosphors.

1   53.   A light source, characterized by:

2   emitting light whose whiteness W is no smaller than 65 when the

3   light is reflected from a blank surface of a newspaper, the

4   whiteness W being calculated using chroma C of the light and

5   an equation (11),

6                    $$W = -3.3C + 100 \cdot \cdot \cdot (11)$$

7   wherein the chroma C is calculated using a method defined

8   by the CIE 1997 Interim Color Appearance Model (Simple Version);

9   emitting light whose chromaticity is, on the CIE 1931

10   chromaticity diagram, in a range expressed by two equations (12)

11   and (13); and

12   emitting light whose visual clarity index is no smaller

13   than 115:

14                  $$y \geqq -2.63x^2 + 2.63x - 0.263 \quad \cdot \cdot \cdot (12)$$

15                  $$y \geqq -3.09x + 1.22 \quad \cdot \cdot \cdot (13).$$

1   54.   The light source of Claim 53,

2   wherein the light source is a fluorescent lamp

3   containing a phosphor layer, the light source emitting light

4   whose peak emissions are in four wavelength ranges of 440nm to

5   470nm, 505nm to 530nm, 540nm to 570nm, and 600nm to 620nm; and

6   wherein a ratio of a radiant energy Qv to a radiant

7   energy Qg satisfy an inequality (14) for a correlated color

8   temperature $T[K]$

9                $Qg/Qv \geqq -0.11 \times 10^4/T + 0.30$ · · · (14)

10   wherein the radiant energy Qv is in a wavelength of

11   380nm to 780nm and radiant energy Qg in a wavelength of 505nm

12   to 530nm.

1   55. The light source of Claim 54,

2   wherein the phosphor layer contains, as major components:

3   a phosphor containing bivalent Europium as an

4   emission center and having a peak emission at a wavelength range

5   of 440nm to 470nm;

6   a phosphor containing bivalent manganese as an emission

7   center and having a peak emission at a wavelength range of 505nm

8   to 530nm;

9   a phosphor containing trivalent terbium as an emission

10   center and having a peak emission at a wavelength range of 540nm

11   to 570nm; and

12   a phosphor containing trivalent europium as an emission

13   center and having a peak emission at a wavelength range of

14   600nm to 620nm.

1   56. The light source of Claim 55,

2   wherein the phosphor containing the bivalent europium as

3   an emission center and having a peak emission at a wavelength

4   range of 440nm to 470nm is composed of at least one of:

5         $BaMgAl_{10}O_{17}:Eu^{2+}$;

6         $BaMgAl_{10}O_{17}:Eu^{2+}$, Mn^{2+} ; and

7         $(Ba, Ca, Sr, Mg)_{10}(PO_4)_6Cl_2:Eu^{2+}$

8   wherein compounds on the left side denote host crystals,

9   and ions on the right side are emission centers contained

10   in the phosphors.

1   57. The light source of Claim 55,

2   wherein the phosphor containing the bivalent manganese

3   as an emission center and having a peak emission at a wavelength

4   range of 505nm to 530nm is composed of at least one of:

5         $BaMgAl_{10}O_{17}:Eu^{2+},Mn^{2+}$;

6         $CeMgAl_{11}O_{19}:Mn^{2+}$;

7         $Ce (Mg, Zn) Al_{11}O_{19}:Mn^{2+}$;

8         $Zn_2SiO_4:Mn^{2+}$; and

9         $CeMgAl_{11}O_{19}:Tb^{3+},Mn^{2+}$

10   wherein compounds on the left side denote host crystals,

11   and ions on the right side are emission centers contained in

12   the phosphors.

1   58. The light source of Claim 55,

2   wherein the phosphor containing the trivalent terbium

3   as an emission center and having an emission peak at a wavelength,

4   range of 540nm to 570nm is composed of at least one of:

5      $LaPO_4:Ce^{3+},Tb^{3+}$; and

6      $CeMgAl_{11}O_{19}:Tb^{3+}$

7   wherein compounds on the left side denote host crystals,

8   and ions on the right side are emission centers contained

9   in the phosphors.

1   59. The light source of Claim 55,

2   wherein the phosphor containing the trivalent europium

3   as an emission center and having an emission peak at a wavelength

4   range of 600nm to 620nm is composed of at least one of:

5      $Y_2O_3:Eu^{3+}$; and

6      $Gd_2O_3:Eu^{3+}$

7   wherein compounds on the left side denote host crystals,

8   and ions on the right side are emission centers contained

9   in the phosphors.

1   60. The light source of Claim 54,

2   wherein the phosphor layer has, as major components:

3   a phosphor containing both bivalent europium and bivalent

4   manganese as emission centers and having emission peaks both

5   at a wavelength range of 440nm to 470nm and at 505nm to 530nm;

6   a phosphor containing trivalent terbium as an emission

7   center and having an emission peak at a wavelength range of 540nm

8   to 570nm; and

9   a phosphor containing trivalent europium as an emission

10 center and having an emission peak at a wavelength range of

11 600nm to 620nm.

1   61. The light source of Claim 60,

2   wherein the phosphor containing the bivalent europium and

3 bivalent manganese as emission centers and having emission peaks

4 both at a wavelength range of 440nm to 470nm and at 505nm to

5 530nm is

6            $BaMgAl_{10}O_{17}:Eu^{2+},Mn^{2+}$

7   wherein a compound on the left side denotes a host crystal,

8 and ions on the right side are emission centers contained in

9 the phosphor.

1   62. The light source of Claim 60,

2   wherein the phosphor containing the trivalent terbium

3 as an emission center and having an emission peak at a wavelength

4 range of 540nm to 570nm is composed of at least one of:

5            $LaPO_4:Ce^{3+},Tb^{3+}$; and

6            $CeMgAl_{11}O_{19}:Tb^{3+}$

7   wherein compounds on the left side denote host crystals,

8 and ions on the right side are emission centers contained

9 in the phosphors.

1   63. The light source of Claim 60,

2   wherein the phosphor containing the trivalent europium

54

3   as an emission center and having an emission peak at a wavelength

4   range of 600nm to 620nm is composed of at least one of:

5         $Y_2O_3:Eu^{3+}$; and

6         $Gd_2O_3:Eu^{3+}$

7   wherein compounds on the left side denote host crystals,

8   and ions on the right side are emission centers contained

9   in the phosphors.

1   64. The light source of Claim 54,

2   wherein the phosphor layer contains, as major

3   components:

4   a phosphor containing bivalent europium as an emission

5   center and having an emission peak at 440nm to 470nm;

6   a phosphor containing both trivalent terbium and bivalent

7   manganese as emission centers and having emission peaks both

8   at a wavelength range of 505nm to 530nm and at 540nm to 570nm;

9   and

10   a phosphor containing trivalent europium as an emission

11   center and having an emission peak at 600nm.

1   65. The light source of Claim 64,

2   wherein the phosphor containing the bivalent europium as

3   an emission center and having a peak emission at a wavelength

4   range of 440nm to 470nm is composed of at least one of:

5         $BaMgAl_{10}O_{17}:Eu^{2+}$;

6         $BaMgAl_{10}O_{17}:Eu^{2+}, Mn^{2+}$; and

7         $(Ba, Ca, Sr, Mg)_{10}(PO_4)_6Cl_2:Eu^{2+}$

8   wherein compounds on the left side denote host crystals,

9 and ions on the right side are emission centers contained in

10 the phosphors.

1   66. The light source of Claim 64,

2   wherein the phosphor containing the trivalent terbium

3 and the bivalent manganese as emission centers and having peak

4 emissions both at a wavelength range of 505nm to 530nm and at

5 540nm to 570nm is

6         $CeMgAl_{11}O_{19}:Tb^{3+},Mn^{2+}$

7   wherein a compound on the left side denotes a host crystal,

8 and ions on the right side are emission centers contained

9 in the phosphor.

1   67. The light source of Claim 64,

2   wherein the phosphor containing the trivalent europium

3 as an emission center and having an emission peak at a wavelength

4 range of 600nm to 620nm is composed of at least one of:

5         $Y_2O_3:Eu^{3+}$; and

6         $Gd_2O_3:Eu^{3+}$

7   wherein compounds on the left side denote host crystals,

8   and ions on the right side are emission centers contained

9   in the phosphors.

1 68. A luminaire, being characterized by:

2   emitting light whose whiteness is no smaller

3 than 85 and whose visual clarity index is no smaller than 110,

4 the whiteness W being calculated using chroma C of the light

5 and an equation (15),

6          $W = -5.3C + 100 \cdot \cdot \cdot (15)$

7   wherein the chroma C is calculated using a method

8   defined by the CIE 1997 Interim Color Appearance

9 Model(Simple Version)

1   69. The luminaire of Claim 68,

2   wherein the light source is a fluorescent lamp

3 containing a phosphor layer, the light source emitting light

4 whose peak emissions are in four wavelength ranges of 440nm to

5 470nm, 505nm to 530nm, 540nm to 570nm, and 600nm to 620nm; and

6   wherein a ratio of a radiant energy Qv to a radiant

7 energy Qg satisfies an inequality (16) for a correlated color

8 temperature T[K]

9          $Qg/Qv \geqq -0.11 \times 10^4/T + 0.30 \cdot \cdot \cdot (16)$,

10 wherein the radiant energy Qv is in a wavelength of

11 380nm to 780nm and radiant energy Qg in a wavelength

12   of 505nm to 530nm.

1   70. The luminaire of Claim 68,

2   wherein the light from the light source is adjusted

3   to a specified spectrum after passing through the translucent

4   cover.

1   71. The luminaire of Claim 68,

2   wherein the light from the light source is adjusted to

3   a specified spectrum after reflected from the reflector.

1   72. A luminaire, being characterized by:

2   emitting light whose whiteness W is no smaller than 85,

3   and whose visual clarity index is no smaller than 115, the

4   whiteness W being calculated using chroma C of the light and

5   an equation (17)

6              $$W = -5.3C + 100 \quad \cdot \cdot \cdot (17)$$

7   wherein the chroma C is calculated using a method defined

8   by the CIE 1997 Interim Color Appearance Model (Simple Version).

1   73. The luminaire of Claim 72,

2   wherein the light source is a fluorescent lamp

3   containing a phosphor layer, the light source emitting light

4   whose peak emissions are in four wavelength ranges of 440nm to

5   470nm, 505nm to 530nm, 540nm to 570nm, and 600nm to 620nm; and

6   -   wherein a ratio of a radiant energy Qv to a radiant

7   energy Qg satisfies an inequality (18) for a correlated color

8   temperature $T[K]$

9            $Qg/Qv \geqq -0.11 \times 10^4/T + 0.30$ · · · (18)

10   wherein the radiant energy Qv is in a wavelength of

11   380nm to 780nm and radiant energy Qg in a wavelength

12   of 505nm to 530nm.

1   74. The luminaire of Claim 72,

2   wherein the light from the light source is adjusted

3   to a specified spectrum after passing through the translucent

4   cover.

1   75. The luminaire of Claim 72,

2   wherein the light from the light source is adjusted to

3   a specified spectrum after reflected from the reflector.

1   76. A luminaire, being characterized by:

2   emitting light whose whiteness is no smaller than 65

3   obtained when the light is reflected from a blank surface of

4   a newspaper, the whiteness being calculated using chroma C of

5   the light and an equation (19),

6            $W = -3.3C + 100$ · · · (19)

7   wherein the chroma C is calculated using a method defined

8   by the CIE 1997 Interim Color Appearance Model (Simple Version);

9   emitting light whose chromaticity is, on the CIE 1931

10   chromaticity diagram, in a range expressed by two equations (20)

11   and (21); and

12   emitting light whose visual clarity index is no smaller

13 than 110:

14             $y \geqq -2.63x^2 + 2.63x - 0.263$ · · · (20)

15                $y \geqq 3.09x + 1.22$ · · · (21).

1   77. The luminaire of Claim 76,

2   wherein the light source is a fluorescent lamp

3 containing a phosphor layer, the light source emitting light

4 whose peak emissions are in four wavelength ranges of 440nm to

5 470nm, 505nm to 530nm, 540nm to 570nm, and 600nm to 620nm; and

6   wherein a ratio of a radiant energy Qv to a radiant

7 energy Qg satisfy an inequality (22) for a correlated color

8 temperature $T[K]$

9            $Qg/Qv \geqq -0.11 \times 10^4/T + 0.30$ · · · (22)

10   wherein the radiant energy Qv is in a wavelength of

11 380nm to 780nm and radiant energy Qg in a wavelength of 505nm

12 to 530nm.

1   78. The luminaire of Claim 76,

2   wherein the light from the light source is adjusted

3 to a specified spectrum after passing through the translucent

4 cover.

1   79. The luminaire of Claim 76,

2   wherein the light from the light source is adjusted to

3   a specified spectrum after reflected from the reflector.

1   80. A luminaire, being characterized by:

2 emitting light whose whiteness W is no smaller than 65 when the

3 light is reflected from a blank surface of a newspaper, the

4 whiteness W being calculated using chroma C of the light and

5 an equation (23),

6      $W = -3.3C + 100 \cdot \cdot \cdot (23)$

7   wherein the chroma C is calculated using a method defined

8 by the CIE 1997 Interim Color Appearance Model(Simple Version);

9   emitting light whose chromaticity is, on the CIE 1931

10 chromaticity diagram, in a range expressed by two equations (24)

11 and (25); and

12   emitting light whose visual clarity index is no smaller

13 than 115:

14      $y \geqq -2.63x^2 + 2.63x - 0.263 \cdot \cdot \cdot (24)$

15      $y \geqq -3.09x + 1.22 \cdot \cdot \cdot (25)$.

1   81. The luminaire of Claim 80,

2   wherein the light source is a fluorescent lamp

3 containing a phosphor layer, the light source emitting light

4 whose peak emissions are in four wavelength ranges of 440nm to

5 470nm, 505nm to 530nm, 540nm to 570nm, and 600nm to 620nm; and

6   wherein a ratio of a radiant energy Qv to a radiant

7 energy Qg satisfy an inequality (26) for a correlated color

8   temperature $T[K]$

9                 $Qg/Qv \geqq -0.11 \times 10^4/T + 0.30$ ・・・(26)

10   wherein the radiant energy Qv is in a wavelength of

11   380nm to 780nm and radiant energy Qg in a wavelength of 505nm

12   to 530nm.

1   82. The luminaire of Claim 80,

2   wherein the light from the light source is adjusted

3   to a specified spectrum after passing through the translucent

4   cover.

1   83. The luminaire of Claim 80,

2   wherein the light from the light source is adjusted to

3   a specified spectrum after reflected from the reflector.